$$\boxed{Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}}$$ If σ is known.

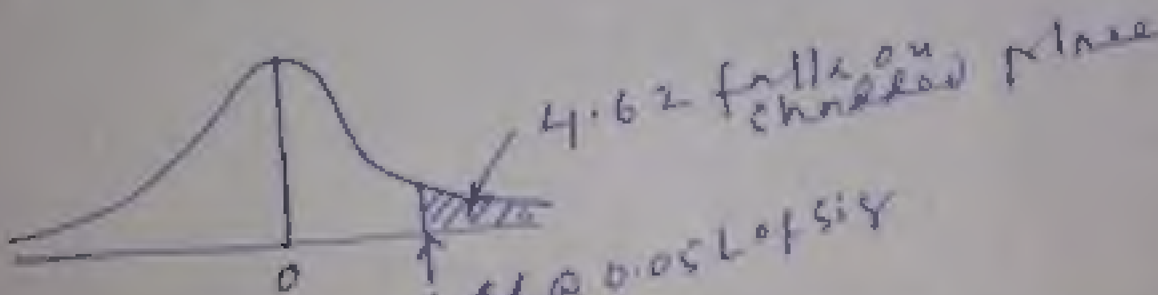
If σ is not known then

$$\boxed{Z = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}}$$

In our test σ is not given. Hence we use second formula ie $Z = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}$

$$Z = \frac{3.0 - 2.7}{0.7/\sqrt{117-1}} = 4.62 //$$

Calculated $Z = 4.62$



Calculated Z value > tabulated Z value

So H_0, is rejected.

Hence there is a significant difference between μ & $\bar{x}$.

Hence $H_0: \bar{x} \neq \mu$

$\boxed{\text{Formula}}$

$SE_M = \sigma_M$ = Standard Error of Mean

$= \sigma/\sqrt{n}$ or $s/\sqrt{n-1}$

Hence $\boxed{\acute{\sigma} = \sqrt{\frac{(x - \bar{x})^2}{n-1}}}$

Q) $n = 400$ (sample size)

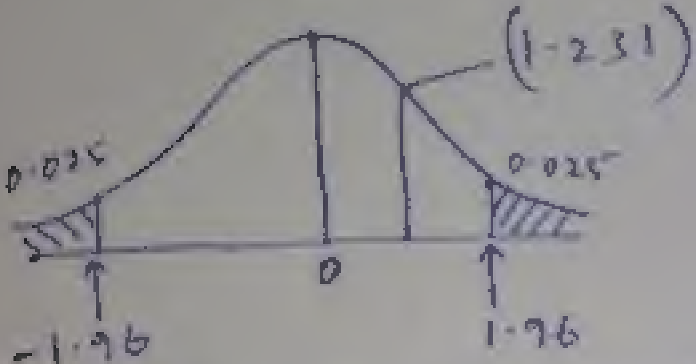
$\bar{x} = 67.47$ (sample mean)

$\mu = 67.39$ (population mean)

σ = S.D of population = 1.3

N = population size (not known) = ?

$$\Rightarrow Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{67.47 - 67.39}{1.3 / \sqrt{400}} = \underline{\underline{1.231}}$$



<u>Decision</u>:- The obtained z value < table value

i.e, $1.231 < 1.96$

Hence H_0 fails to reject (accepted)

So there is no significant difference between sample mean & population mean.

Hence $H_0: \bar{x} = \mu$

Q)

	Hourly earnings	SD	n
Mumbai City	\$ 8.95	0.4	200
Delhi City	\$ 9.1	0.6	175

Co. has to test @ 5% Level of significance.

Ans It is a two Sample test as μ_1 & μ_2 are given also Samples are more than 30 each, Hence it is Called 2 Sample Z test

$H_0 : \mu_1 = \mu_2$

$H_a : \mu_1 \neq \mu_2$ (L+7)

$$\boxed{\sigma_{x_1x_2} = \sqrt{\frac{(\sigma_1)^2}{n_1} + \frac{(\sigma_2)^2}{n_2}}}$$

$$\sigma_{x_1x_2} = \sqrt{\frac{(0.4)^2}{200} + \frac{(0.6)^2}{175}} = \$\ 0.053$$

$$\boxed{Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{x_1x_2}}}$$

$$= \frac{(8.95 - 9.1) - 0}{0.052} \longrightarrow \boxed{\mu_1 = \mu_2 = 0 \text{ in Hypothesis}}$$

$= -2.83$

The table value of Z is -1.96

The calculated value > tabulated value
$\Rightarrow -2.83 > -1.96$

Hence H_0 is rejected & H_a is accepted
So there is a significant difference
between the earnings of two cities.

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(Q) In a provincial election, 55% of voters rejected lotteries. A random sample of 150 rural communities showed that 49% of voters rejected lotteries. Is the difference significant?

Ans Sample is more than 30 i.e 150
So it's a Z test.

proportions are given (%) instead of No.s.

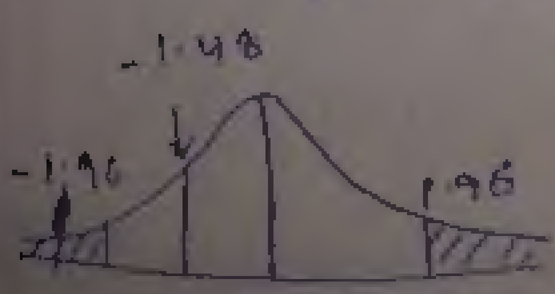
P_s = Sample proportion =
P_U = population proportion =

$$\boxed{Z = (P_s - P_U) \Big/ \sqrt{P_U(1-P_U)/n}}$$

$H_0: P_s = P_U$; $H_a: P_s \neq P_U$

$$Z = \frac{0.49 - 0.55}{\sqrt{0.55(1-0.55)/150}} = -1.48$$

Z value @ 0.025% = −1.96



Calculated value < table value
i.e $-1.48 < -1.96$
Hence H_0 fails to reject (accepted)
there is no significant difference between two proportions.